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NOTES ON GEOGRAPHIC DISTRIBUTION

Distribution extension of *Phaenomys ferrugineus* (Thomas, 1894), and new data on *Abrawayaomys ruschii* Cunha and Cruz, 1979 and *Rhagomys rufescens* (Thomas, 1886), three rare species of rodents (Rodentia: Cricetidae) in Minas Gerais, Brazil

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ABSTRACT: Herein we report for the first time the occurrence of *Phaenomys ferrugineus* in the state of Minas Gerais and present additional data on the geographical distribution of *Abrawayaomys ruschii* and *Rhagomys rufescens* in this state. These latter two species were reported from some localities in the Atlantic Forest of Brazil, but their presence in Minas Gerais state is restricted to few localities. These data reinforce the necessity of surveys over long periods of time and the use of pitfall traps in order to establish the real geographical distribution of small mammal species and to indicate priority areas for the conservation of this group of mammals.

Phaenomys ferrugineus (Thomas, 1894), *Abrawayaomys ruschii* Cunha and Cruz, 1979 and *Rhagomys rufescens* (Thomas, 1886) are rare and poorly known species of rodents with few records of occurrence in the Atlantic Forest of south and southeastern Brazil (Rossaneis *et al.* 2010). Herein we report for the first time the occurrence of *P. ferrugineus* in the state of Minas Gerais, extending the range of this species, and present additional data on the geographical distribution of *A. ruschii* and *R. rufescens*. In Minas Gerais, *A. ruschii* was recorded in the localities of the Parque Estadual do Rio Doce (19°30' S, 42°31' W - locality 2, Figure 3), Viçosa (20°47' S, 42°55' W - locality 3, Figure 3) and São Sebastião das Águas Claras (20°04' S, 43°54' W - locality 5, Figure 3). *Rhagomys rufescens* was recorded in Viçosa (20°45' S, 42°53' W - locality 2, Figure 5), Juíz de Fora (21°41' S, 43°27' W - locality 3, Figure 5) and Poços de Caldas (21°47' S, 46°34' W - locality 6, Figure 5). These three species were collected during inventories in Minas Gerais (IBAMA license number: 14083-1), mainly related to the BiotaMinas Project (FAPEMIG), and the specimens were preserved as skins and skulls housed at the Mammal Collection of the Universidade Federal de Lavras (CMUFLA).

Phaenomys ferrugineus is a medium-sized rodent with a brilliant rust-colored pelage on the upper surface of head and body, the undersurface and sides lighter yellowish-white, ears dark brown, with tail dark gray, longer than head and body (Bonvicino *et al.* 2001). In the specimen collected, the dorsum is rust-colored with lighter laterals, but gray-based hairs. The color of the ventral surface is yellowish white, with gray-based hairs. The hairs on the neck are completely white to the base. The coloration of the dorsal surface of the hind legs is similar to the dorsum. The tail is unicolor, dark brown and slightly hairy, and has an inconspicuous hair pencil at the tip. It is only known from 11 specimens in three collecting localities: two in the state of Rio de Janeiro: Sacovão, near Teresópolis (Vaz 2000, locality 2, Figure 1) and Nova Friburgo (Bonvicino *et al.* 2001, locality 1, Figure 1), and one in the state of São Paulo, Serra da Bocaina (Vaz 2000, locality 3, Figure 1). This is the first record of *P. ferrugineus* for Minas Gerais state, and represents the westernmost record of this species, extending its range *ca.* 60 km northwest from the closest known locality (Serra da Bocaina). The specimen CMUFLA 904 was captured during a field inventory using pitfall traps (plastic buckets of 40-liter volume) connected to drift fences at Casa Alpina Hotel (22°21'51" S, 44°48'29" W, locality 4, Figure 1), nearly 14 km to the east of the municipality of Itamonte (Figure 1), on February 12, 2011. The area is mainly covered by montane Atlantic Forest, in good conservation status. The collecting site is located at 1550 m of altitude, with abundant leaf litter and a continuous and dense canopy formed by young trees. The capture site is connected to the Parque Nacional do Itatiaia. In this area, sampling was carried out from September 2010 to February 2011 along 15 nights, comprising a total trapping effort of 2160 trap.nights (1928 sherman trap.nights and 232 pitfall trap.nights in "Y" format). The captured individual (Figure 2) was an adult male weighting 80 g, head and body length 148 mm, tail length 184 mm, hind foot length 31 mm and ear length 20 mm (CMUFLA 904). Cranial measurements of this specimen are given in Table 1. This record reinforces the endemism of the species in the Atlantic Forest of southeastern Brazil (Fonseca *et al.* 1996; Vaz 2000) and it may be restricted to the region of the Serra da Mantiqueira and Serra da Bocaina range and

surrounding areas.

Abrawayaomys ruschii is a remarkable species of rodent recognized by the presence of dark spiny hairs on its back and laterals, while its belly is light colored and its tail is squamous (Cunha and Cruz 1979). It shows unusual craniodental morphology and it has been assigned to the Thomasomyini tribe (Pardinãs *et al.* 2009). The species was first recorded in the state of Espírito Santo (Cunha and Cruz 1979), with later records for the states of Minas Gerais (Stallings *et al*. 1991), Santa Catarina (Cherem *et al*. unpublished data) and Rio de Janeiro (Cunha and Rajão 2007; Pereira *et al*. 2008). The distribution of *A. ruschii* also included the province of Missiones in Argentina, but recent morphological analyses showed that these populations belong to another species of the genus, *A. chebezi* (Pardinãs *et al*. 2009). The specimen of *A. ruschii* was captured during a field inventory using pitfall traps (plastic buckets of 40-liter volume) connected to drift fences in the municipality of Caeté (20°01'04" S, 43°42'56" W, locality 4 in Figure 3), Minas Gerais state, Brazil. The animal was captured in a remnant of Ombrophylous Atlantic Forest, located near the Parque Estadual da Serra do Cipó on June 5, 2008. The area is composed of Atlantic Forest vegetation; the forest is in the intermediate stage of regeneration, near a stream, with 679 m. of altitude. The captured individual (CMUFLA 906, Figure 4) was an adult female weighting 40 g, head and body length 95 mm, hind foot length 20 mm, ear length 19 mm, and the tail was cut short when it was captured. The cranial measurements of the specimen are given in Table 1.

The other species is *Rhagomys rufescens*, another rare South American rodent, found in only nine localities in the states of Espírito Santo, Minas Gerais, Rio de Janeiro, São Paulo and Santa Catarina (Geise *et al*. 2004; Pinheiro *et al.* 2004; Percequillo *et al.* 2004; Steiner-Souza *et al.* 2008; Percequillo *et al.* 2011). The presence of a nail on the hallux in this genus is a unique character state among New World cricetids (D'Elía *et al*. 2006). The species has an uniformly orange dorsum, the belly being slighter, also orange with gray-based hairs; the tail is longer than head and body, with short black hairs (Oliveira and Bonvicino 2006). In the specimen collected (CMUFLA 905), the dorsum is reddish brown, similar to the lateral sides, with gray-based hairs. The color of the ventral surface is similar to that of the dorsum, but slightly more orange, with gray-based hairs, except for a small area on the chin, where the hairs are entirely orange. The tail is unicolor, brownish and slightly hairy in its entirety, and has an inconspicuous

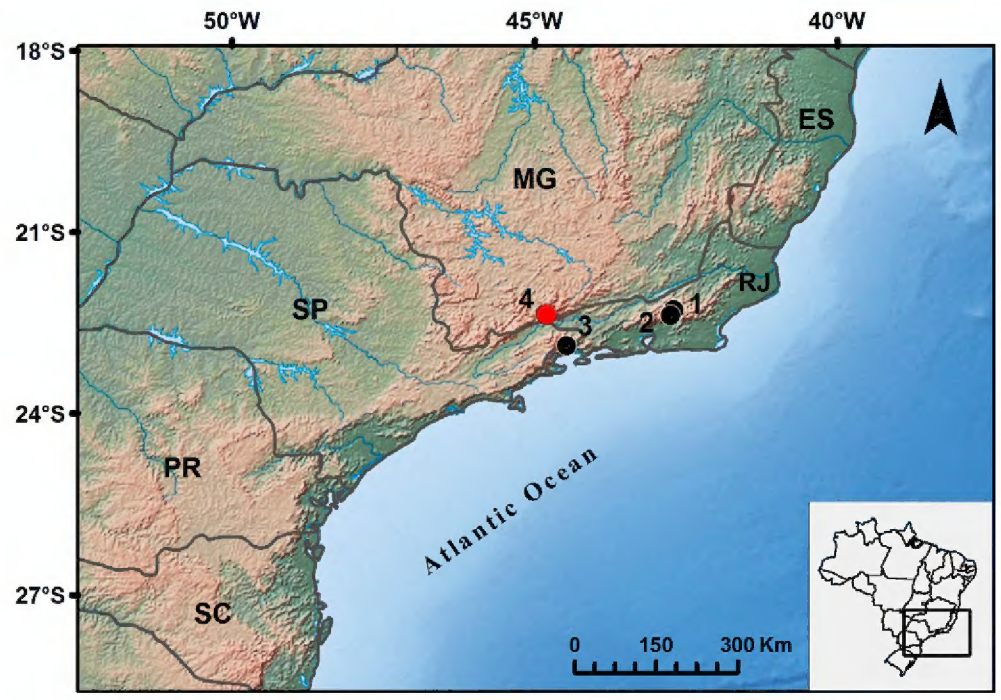

Figure 1. Map showing collecting localities of *Phaenomys ferrugineus*, with new record for the state of Minas Gerais in red circle. Collection localities: Rio de Janeiro: 1. Nova Friburgo (22°17' S, 42°41' W); 2. Sacovão, Teresópolis (22°22' S, 42°44' W); São Paulo: 3. Serra da Bocaina (22°50' S, 44°28' W); Minas Gerais: 4. Itamonte (22°21'51"S, 44°48'29"W).

Figure 2. *Phaenomys ferrugineus* from municipality of Itamonte, Minas Gerais, Brazil (CMUFLA 904). Photo by Gabrielle Pacheco. Dorsal, ventral and lateral views of the skull and lateral view of mandible. Photos by Paula Ferracioli.

hair pencil at the tip. This specimen were collected using pitfall traps (plastic buckets of 40-liter volume) connected to drift fences during an inventory in Parque Estadual da Serra do Papagaio, municipality of Baependi, Minas Gerais on May 21, 2008. This conservation unit has 22,900 ha of montane Atlantic Forest, and the vegetation of the area (22°09'12" S, 44°44'09" W, locality 4 in Figure 5) is located at 1714 m. of altitude and is composed mainly by forest in medium stage of succession. This locality (Figure 5) was one of the gaps in knowledge of the geographical distribution of the species, since records were confirmed in the nearby city of Juiz de Fora (Granzinolli and Motta-Junior, 2006, locality 3 in Figure 5) and Poços de Caldas (locality 6 in Figure 5) in Minas Gerais, as well as Ubatuba (locality 5 in Figure 5) in São Paulo (Steiner-Souza *et al.* 2008). The captured individual (CMUFLA 905, Figure 6) was an adult male weighting 16 g, head and body length 65 mm, tail length 105 mm, ear length 12 mm, and hind foot length 17 mm. The cranial measurements of the specimen are given in Table 1.

The three species reported here were collected in pitfall traps in areas above 600 m. of altitude and two of them (*P. ferrugineus* and *R. rufescens*) are listed as endangered species in Brazil (Machado *et al.* 2008). Moreover, only one of the three localities where the specimens were collected in this study is protected in the form of integral conservation areas (Parque Estadual da Serra do Papagaio). This reinforces the necessity of surveys over long periods of time and the incorporation of combined sampling techniques (*e.g.*, pitfall and live traps) in order to acquire a deeper understanding of the diversity and distribution of small mammal species, which can help in the establishment of priority areas for conservation (Hice and Schmidly 2002; Umetsu *et al.* 2006).

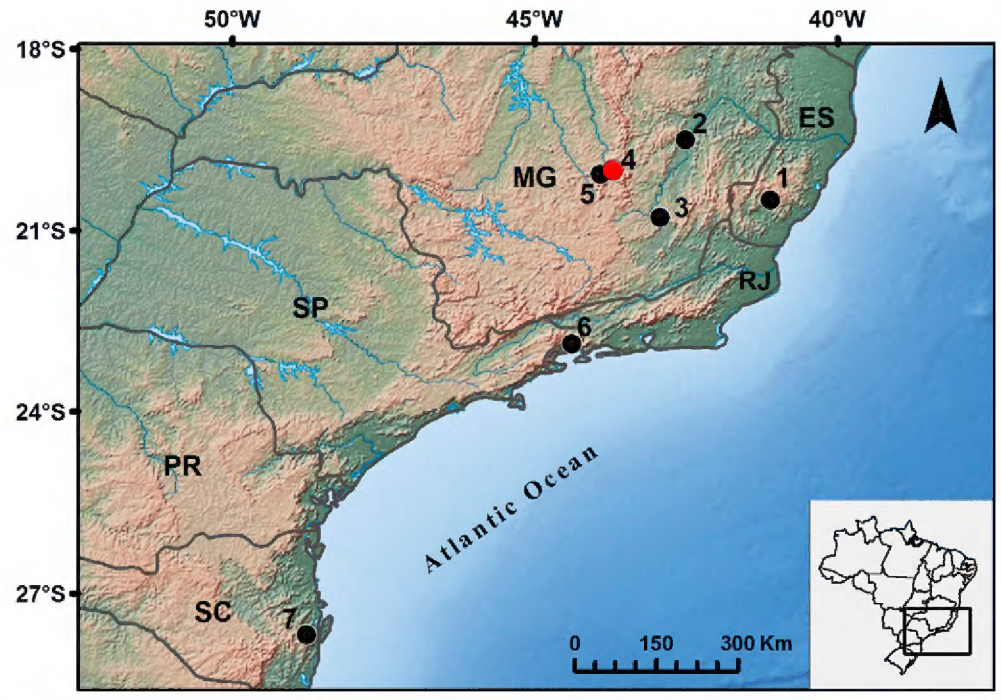

Figure 3. Map showing collecting localities of *Abrawayaomys ruschii*, with new record for the state of Minas Gerais in red circle. Collection localities: Espírito Santo: 1. Reserva Biológica de Forno Grande (20°30' S, 41°06' W). Minas Gerais: 2. Parque Estadual do Rio Doce (19°30' S, 42°31' W); 3. Vtiçosa (20°47' S, 42°55' W); 4. Caeté (20°00' S, 43°42' W); 5. São Sebastião das Águas Claras (20°04' S, 43°54' W). Rio de Janeiro: 6. Aldeia Sapucaí (22°53' S, 44°23' W). Santa Catarina: 7. Santo Amaro da Imperatriz (27°41' S, 48°46' W).

Figure 4. Dorsal and lateral views of a skin of *Abrawayaomys ruschii* from the municipality of Caeté, Minas Gerais, Brazil (CMUFLA 906) with dorsal, ventral and lateral views of the skull and lateral view of mandible. Photos by Paula Ferracioli.

Table 1. Cranial measurements based in Bonvicino et al. (2001), taken with a digital caliper to the nearest 0.01 mm of the specimens of adult male *Phaenomys ferrugineus* (CMUFLA 904), adult female *Abrawayaomys ruschii* (CMUFLA 906) and adult male *Rhagomys rufescens* (CMUFLA 905) collected in Minas Gerais state.

MEASUREMENT	CMUFLA 904	CMUFLA 906	CMUFLA 905
Occipito-Nasal Length	35.79	28.15	26.41
Condylo-Incisive Length	29.58	24.45	22.20
Zygomatic Breadth	19.47	15.99	14.62
Braincase Breadth	14.35	13.24	12.28
Palatal Length	14.28	11.57	11.59
Orbital Fossa Length	12.40	9.86	10.12
Diastema Length	8.90	8.98	8.21
Incisive Foramen Length	7.11	5.35	3.81
Molar-Row Length	6.46	4.57	4.24
Palatal Bridge Length	6.31	5.32	6.24
Rostral Breadth	5.88	4.82	3.91
Interorbital Breadth	4.99	5.82	4.92
Palatal Breadth at M1	3.86	3.36	2.61
Incisive Foramen Breadth	3.31	1.66	1.37
Zygomatic Plate Length	2.98	3.76	3.51
Greatest Length of Mandible	17.58	16.78	14.03
Mandibular Molar Row	6.80	4.49	4.43

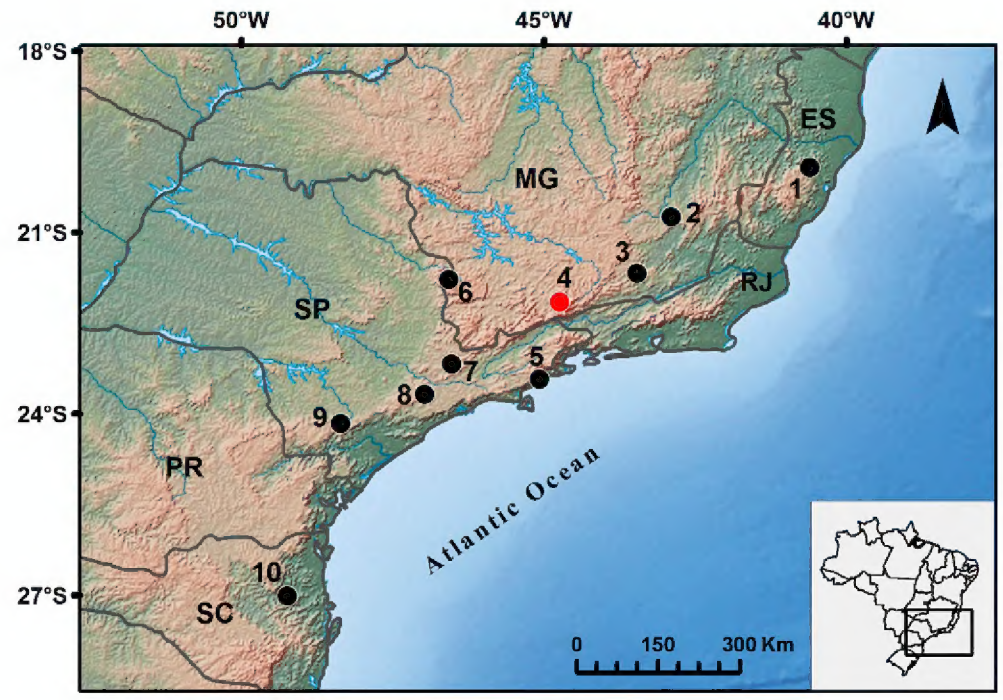

Figure 5. Map showing collecting localities of *Rhagomys rufescens*, with new record for the state of Minas Gerais in red circle. Collection localities: Espírito Santo: 1. Santa Teresa (19°56' S, 40°36' W). Minas Gerais: 2. Viçosa (20°45' S, 42°53' W); 3. Juíz de Fora (21°41' S, 43°27' W); 4. Parque Estadual da Serra do Papagaio (22°09' S, 44°43' W); 6. Poços de Caldas (21°47' S, 46°34' W). São Paulo: 5. Parque Estadual da Serra do Mar, Ubatuba (23°26' S, 45°04' W); 7. Atibaia (23°10' S, 46°31' W); 8. Reserva Florestal Morro Grande, Caucaia do Alto (23°41' S, 46°58' W); 9. Ribeirão Grande (24°10' S, 48°21' W). Santa Catarina: 10. Mono, Parque Natural Municipal Nascentes do Garcia, Indaial (27°01' S, 49°14' W).

Figure 6. *Rhagomys rufescens* from Parque Estadual da Serra do Papagaio, Minas Gerais, Brazil (CMUFLA 905). Photo by Daniel Rocha. Dorsal, ventral and lateral views of the skull and lateral view of mandible. Photos by Paula Ferracioli.

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